

Incredible Journey

How environmental service-learning transformed my teaching practices

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### Abstract

Service-learning is a collaborative project that benefits students and the community. Through hands-on activities, students increase their academic achievement, social/emotional development, and obtain an understanding of their role in their community. The community benefits from the services that the students provide. In the fall of 2010 my students participated in an environmental service-learning project. After reflecting on the experience I wanted to determine whether I could use an environmental service-learning project to facilitate students in a K-4 self-contained special education meeting some of the state science and social studies standards.

### **Incredible Journey**

My class participated in an environmental service-learning project in the fall of 2010 and winter of 2011. Our class raised salmon in the classroom, conducted water quality testing on a local stream, planted trees, and participated in salmon tossing. My students were eager participants and wanted to continue this learning experience. However, many of my colleagues questioned these activities. They viewed them as “fun field trips” that I could get away with planning because I am a special education teacher. As general education teachers they feel that there is not time for these “fun” activities and that their job is to teach reading, writing, math, social studies, and science so their students can meet state standards.

My colleague’s comments triggered some reflective thinking. Although I am a special education teacher, my students are also required to meet state standards. My class is comprised of ten students. Ninety percent of my students are on the autism spectrum and have diverse learning needs. My K-4 self-contained classroom makes it challenging to provide quality instruction in all of these areas to meet the individual needs of my students. Our state is committed to No Child Left **Inside??**. The Office of Superintendent of Public Instruction and environmental agencies have designed an Environmental and Sustainability Literacy Plan that incorporates state science and social standards. Only 14.1% of the 5<sup>th</sup> grade students in my school passed the state science assessment. There is pressure to improve student achievement in science.

After considering the needs and desires of my students and the requirements the state imposes on teachers, I wondered if I could use an environmental service-

learning project to facilitate my students meeting some of the state science and social studies standards.

### **Problem Statement**

Can I use an environmental service-learning project to facilitate my students meeting the following state science and social studies standards:

#### Science

- K-1 LS3A - Some things are alive and others are not
- K-1 LS2B – A habitat supports the growth of many different plants and animals by meeting their basic needs of food, water, and shelter.
- 2-3 LS2A – Ecosystems support all life on the planet, including human life, by providing food, fresh water, and breathable air.
- 2-3LS2D – Humans impact ecosystems in both positive and negative ways. Humans can help improve the health of ecosystems so that they provide habitats for plants and animals and resources for humans over long term.
- 4-5LS2A – Identify the living and nonliving parts of an ecosystem. Give examples to show how the plants and animals depend on one another for survival. Describe how the plants and animals in an ecosystem depend on nonliving resources.
- 4-5LS2F – Describe ways that humans can improve the health of ecosystems. Describe ways that humans can harm the health of ecosystems.

#### Social studies

- 3.2 – Understands human interaction with the environment.
- 5.2 – Creates and uses a research question to conduct research on an issue or event.

### **Literature Review**

The National Service Learning Clearing House defines service-learning as, “a teaching and learning strategy that integrates meaningful and community service with instruction and reflection to enrich the learning experience, teach civic responsibility, and strengthen communities” (2010). This is supported by John

Dewey's theory that all genuine learning comes from experience (Jenkins and Sheehey, 2009).

Service-learning also increases academic achievement. Language arts, reading, social studies, science, and technology can be integrated into a service-learning project (Ponder and Lewis-Ferrel, 2009). One example would be research science learning where students learn how to conduct a literature review, identify research questions, take field notes, gather/analyze data, and interpret results (Reynolds and Ahem-Dodson, 2010). Students apply critical thinking skills when they identify a problem, research/analyze it's causes, and propose and implement a solution that might lead to social change (Mitchell, 2007). Reflection is a large component of service-learning. It gives students the opportunity to process and synthesize what they have learned (Terry and Bohnenberger, 2004).

One of the characteristics of service-learning is reciprocity. Interaction flows from the school to the community and from the community to the school (Dentith and Harper, 2010).

Motivating students to learn is also an outcome of service-learning. Identifying a real-life problem in the community and searching for solutions is a compelling reason to learn (McPherson, 2011).

Service-learning provides an opportunity to provide differentiation to meet individual student needs (Lawrence and Butler, 2010). It also provides students a chance to experience new opportunities that might lead to future educational and career paths (Stepath and Bacon, 2010).

Service-learning also increases students' social-emotional development (Hutzel and Russell and Gross, 2010). Research indicates that service-learning facilitates students maintaining character assets such as caring, altruism, citizenship, civic responsibility, persistence, and respect for self and others (Furco and Root (2010). This is an important component for students on the autism spectrum. The Diagnostic and Statistical Manual of Mental Disorders Fourth Edition lists three characteristics of autism: deficit in social interaction, deficit in communication, and restricted repetitive and stereotypical patterns of behavior, interests, and activities (Autism Speaks, 2011). Individuals that have autism may also have impairment in Theory of Mind (ToM). Theory of Mind is the ability to understand another perspective (Attwood, 2008).

### **Ethics**

The parents of each of the participants completed informed consent forms. Confidentiality was maintained by coding data. Triangulation of quantitative and qualitative data simultaneously provides a complete picture and increases the credibility of the study.

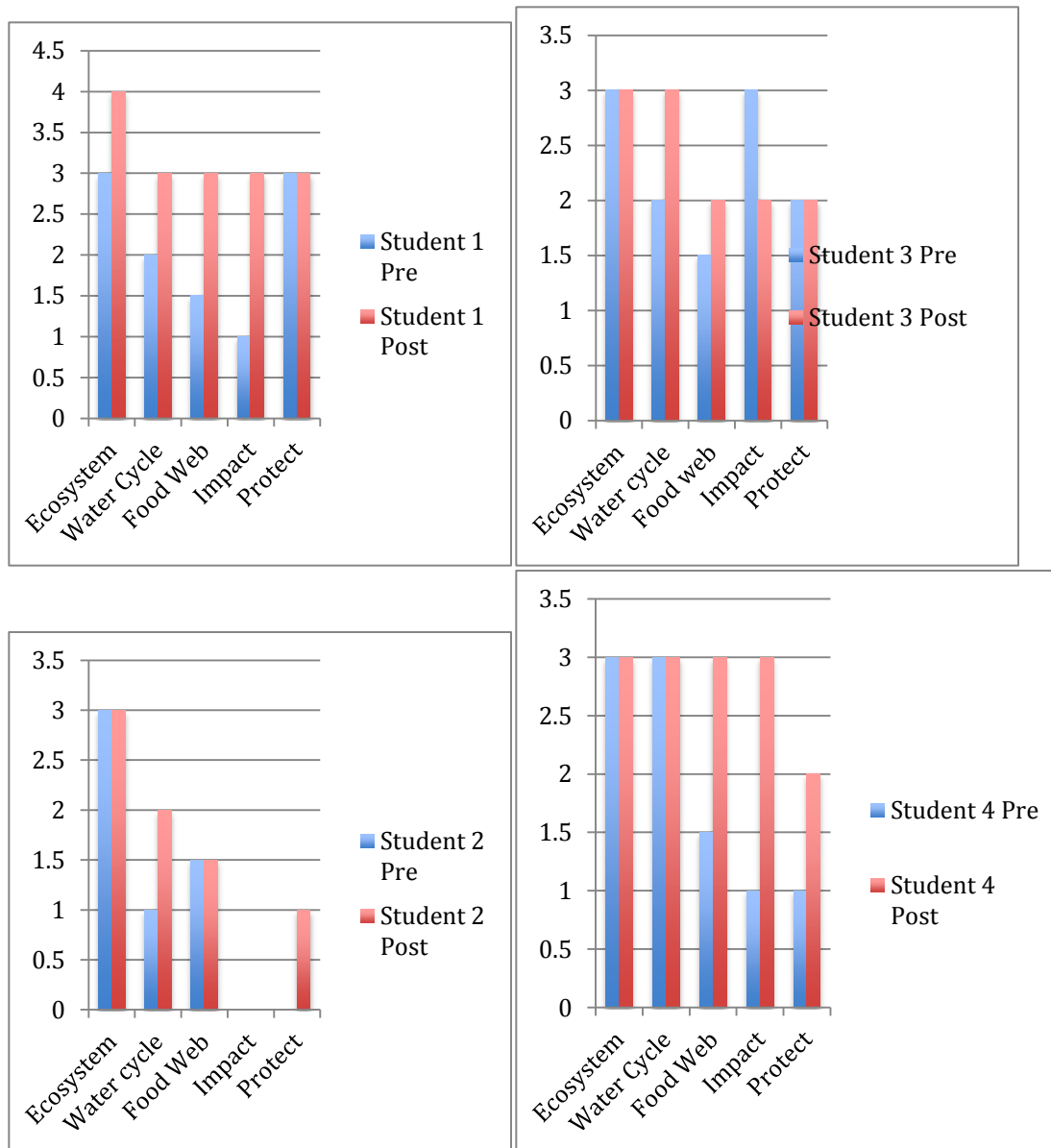
### **Data Collection**

This is a mixed methods action research project. I collected the following quantitative data: pre/post test, salmon life cycle sequencing cards, living/non-living picture sort. Qualitative data was collected during individual and focus group interviews as well as from student journal entries. The pre/post test and interview questions were designed around the state science and social studies standards. Although a deficit in writing is not a characteristic of autism as defined by the

Diagnostic and Statistical Manual of Mental Disorders Fourth Edition, all of my students have an aversion to writing. Assessments were designed so students could draw pictures and dictate answers to test questions.

### **Data Analysis and Findings**

Eight out of ten students completed the assessments. One student had extended absences and was unable to participate. Another student refused to participate in the post-assessment.



#### 4<sup>th</sup> Grade pre/post assessment

**Ecosystems:** Pre-assessment shows all students met standard (3). Post-assessment shows all students meeting standard and one student exceeding standard.

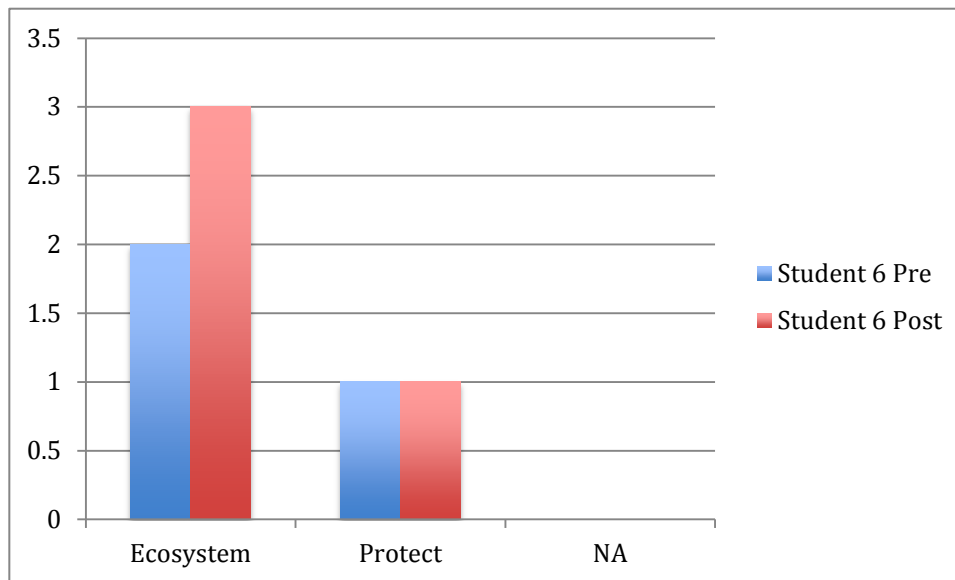
**Water Cycle:** Pre-assessment indicates that 1:4 students met standard. Post-assessment shows that 3:4 students met standard.

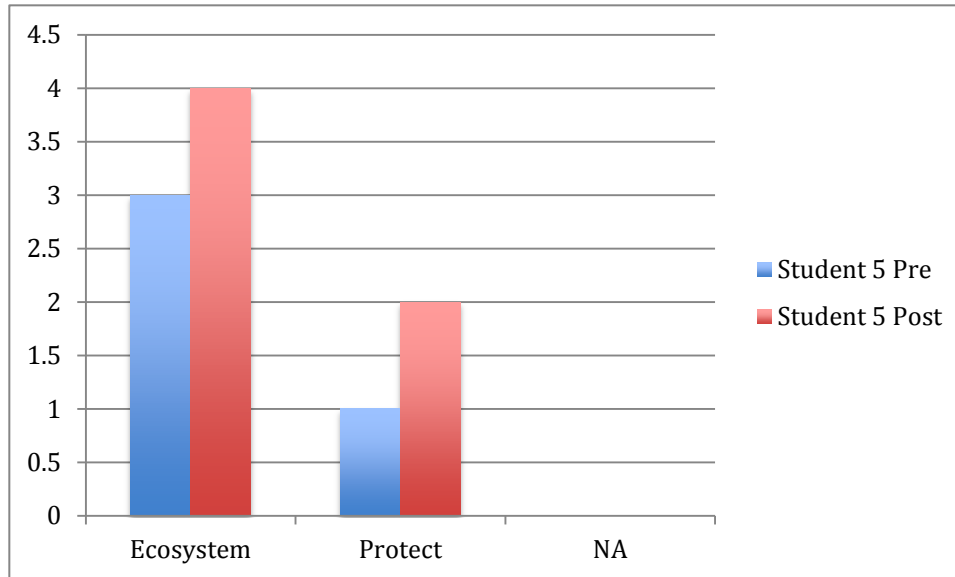
**Food Web:** Pre-assessment indicates 0:4 students met standard. Post-assessment shows that 2:4 students met standard.



**Impact:** Pre-assessment indicates 1:4 students met standard. Post-assessment shows that 2:4 students met standard. One student's score went down a point. Is his score being impacted by an inability to perspective take? Does he assume that because he has demonstrated that he can identify four or more ways that humans impact the earth in previous assessments and/or discussions that I will automatically give him a passing score for this assessment?

**Protect:** Pre-assessment indicates that 1:4 students met standard. Post assessment shows that 1:4 students met standard. However, 2:4 students increased their score.



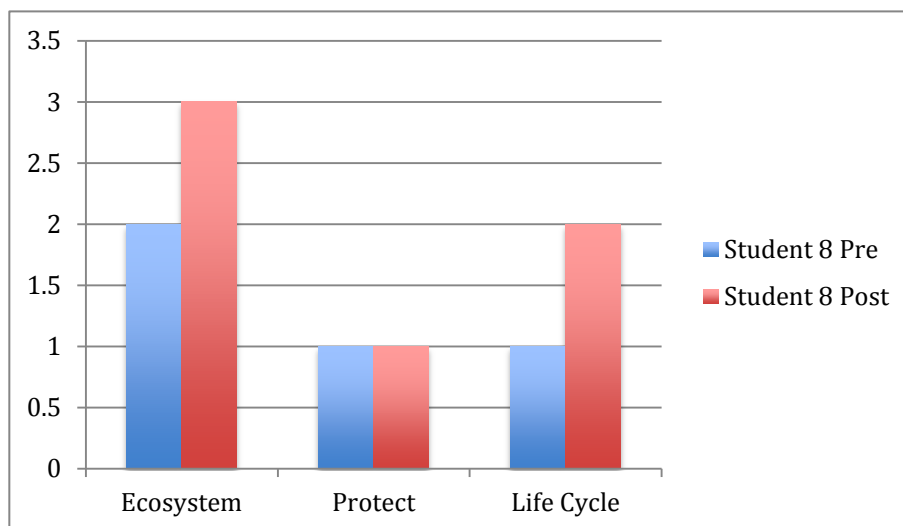


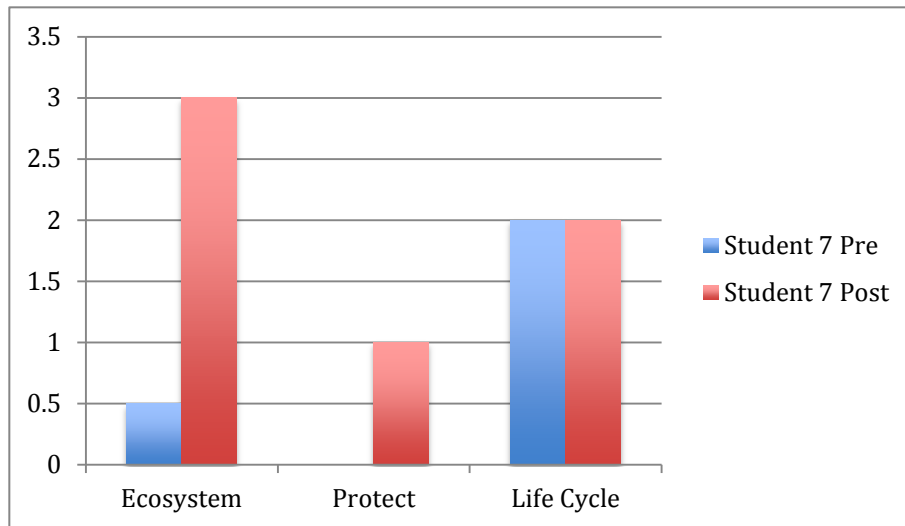
### 2<sup>nd</sup> Grade pre/post assessment

**Ecosystem:** Pre-assessment indicates that 1:2 students met standard. Post-assessment shows that 2:2 met standard with one student exceeding standard.

**Protect:** Pre/post assessments indicate that 0:2 students meet standard at this time.

However, one student showed an increase in achievement.





#### Kindergarten pre/post assessment

**Ecosystem:** Pre-assessment indicates that 0:2 students meet standard. Post-assessment shows that 2:2 students meet standard.

**Protect:** Pre-assessment indicates that 0/2 students meet standard. Post-assessment shows that 0/2 students meet standard. However, one student demonstrated achievement.

**Life cycle:** Pre-assessment indicates that 1:2 students meet standard. Post-assessment shows that 2:2 meet standard.

Another area that I assessed through interviews was living/non-living. Each of the grade levels created their own definition.

- Kindergarten: It moves if it is living.
- 2<sup>nd</sup> grade: Living things move, grow, and eat food.
- 4<sup>th</sup> grade: Living things breathe, move, change/grow, drink/eat

Although each of the groups were able to determine a definition, only 2:8 students were able to sort pictures using their definition.

Students also demonstrated understanding of lessons through journal reflections. Student 3 writes, "If animals eat more toxic other animals that eat them will just get killed." Student 4 writes, "Don't buy products with polyethylene. It can pollute the water and kill animals." Student 2 writes, "The fish eats plastic they can die. Some toothpaste has plastic. Don't buy toothpaste with plastic." Student 4 writes, "Poison will kill the producers then the consumers, then the people. Next, the world people can kill the producers by poison." The student labeled this journal entry, "Death Cycle." He explained that we have been learning about life cycles, water cycles, food webs and how they are all connected. He thinks we should include "death cycle" in this unit of study.

My younger students' entries were specific about the hands-on activities that they had participated in. Students participated in a bioaccumulation game. My younger students related their learning to the role they played in the game. For example, fish eat insects where the student was a fish.

This service-learning project also addressed the fourth grade social studies standard, "creates and uses a research question to conduct research on an issue or event" (OSPI, 2011). At the end of our previous service-learning project, the students were curious about the effects of storm water on our watershed. As a group, they formulated a question and conducted water quality tests on the storm water from the housing development behind our school.

While analyzing the data, themes developed. Students connected new information learned during this month long water unit with prior knowledge. The following charts illustrate how student thinking changed.

## How Humans Impact The Environment

4/21/11	5/19/11
Littering	Littering
Water Pollution	Water pollution
Air Pollution	Air Pollution
Oil Spills	Oil Spills
	Interrupting the water cycle
	Hazardous materials in drain
	Cutting trees/picking plants

## What Can You Do To Protect Salmon Habitat?

4/21/11	5/19/11
Pick up trash	Don't interrupt the water cycle
Give money to build a machine that separates oil and water (oil spill)	Don't interrupt the food chain
Ride bikes	Don't buy products with polyethylene

Toss salmon	Don't litter
Don't litter	Don't pollute
Make posters "Please don't pollute"	Don't have oil spills
	Recycle
	Use hazardous materials the right way
	Compost

"Service-learning is a teaching and learning strategy that integrates meaningful and community service with instruction and reflection to enrich the learning experience, teach civic responsibility, and strengthen communities" (National Service Learning Clearing House, 2010). I implemented these components to facilitate my students meeting some of the state science and social studies standards. Service-learning is a cyclical process (National Youth Leadership Council, 2011). As the fall/winter service-learning project came to an end, my students wanted to learn about how storm water affects the watershed. My first step was to access community partners to help us in this investigation. Pierce County Public Works and Utilities provided my class with two hands-on activities to support student learning about the water cycle and how salmon use their sense of smell to find their spawning place. They also provided supplies so my students can mark the storm sewers in the housing development behind our school. Nisqually River Education Project provided the students with supplies to conduct water quality tests. King County provided curriculum for learning about household

hazardous waste. In return, students are monitoring storm water and creating educational opportunities for the members of the housing community. There is reciprocity between the school and community (Dentith and Harper, 2010).

The project was integrated into the reading, writing, science, social studies, math, and technology curriculum for each of the grade levels (Ponder and Lewis-Ferrel, 2009). Leveled readers were used to differentiate for individual students. (Lawrence and Butler, 2010).

Although not every student showed an increase in every category evaluated, every student did increase in at least one or more areas. Students were very engaged in the hands-on activities and authentic experiences provided by this project (Jenkins and Sheehey, 2009).

Journal entries were also an integral part of the project. Student reflections indicated whether students understood the main idea of the lesson or activity. It also provided the level of critical thinking the student was using (Terry and Bohnenberger, 2004).

Students also demonstrated critical thinking skills during small group activities. For example, fourth grade students identified the problem of this study: the affects of storm water on the watershed. Then they researched the problem through curriculum and on-line resources. Next, they conducted water quality tests on the storm water from the housing development behind the school. The water tests they conducted indicated that the Ph, nitrate, and turbidity levels were within acceptable limits. Students then continued their research to determine whether these results indicated that the water was safe for wildlife. They found that the

testing that they were able to conduct does not indicate safe water for wildlife. The students then proposed to educate the members of the housing development about safe storm water practices (Mitchell, 2007).

Another example of critical thinking took place during the bioaccumulation activity. During this activity, students were placed in the role of either a producer or a consumer. Blue and black beads were used as food. Students were allowed to access food from either the sun (producer) or a producer that is specific to their species. At the end of the game, students recorded and analyzed the number and color of beads that each of them had consumed. At this point they were told that the blue beads were healthy food and that the black beads were toxic. Students then discussed what the results of the activity meant. This activity simulated a research sciences learning experience where students identified a research question, analyzed the data, and interpreted the results (Reynolds and Ahem-Dodson, 2010). After completing the bioaccumulation activity, fourth grade students demonstrated an understanding of how toxins affect the food chain.

This project also impacted the social-emotional development of my students. One of the characteristics of autism is a deficit in social interaction. When completing water quality tests, students worked with a partner. This required taking turns using equipment and recording data. Each of the groups was able to work independently. Another example of social-emotional development took place during the bioaccumulation activity. Due to the small size of our class, it required all of the students as well as paraeducators and teacher to participate. Each participant would be assigned a role to play. A pictorial name tag that also provided



information about what their organism ate as well as what organism ate them identified participants. The role of the producers was the most complex and therefore the fourth graders would need to assume those roles. I met with them prior to the activity and explained the game and why they needed to be producers. At first the students were upset and insisting on being allowed different roles. After discussing the reasoning behind the role assignments, all of the fourth graders agreed to take on the assigned role. During the activity, one of the producers became sensory overloaded and needed to take a break. The rest of the students continued the activity until a signal to end. Although the students have a deficit in perspective taking (Attwood, 2008), they understood that it was their civic responsibility to complete the activity (Furco and Root, 2010).

Theory of Mind (ToM) also impacts motivation. An individual with a deficit in ToM may not choose to participate in activities not of their choice. One of my students who has a deficit in this area is reluctant to complete assigned tasks. After completing the post-assessment he said, "I really like it when we don't have to work." He had just completed a journal entry, three drawings, and an individual interview. He had probably written more that day than he usually does in three days. However, he didn't perceive it as work. I also noticed that his journal entries were longer in his science journal than in his writing journal. Research indicates that service-learning increases student motivation (McPherson, 2011).

Service-learning also gives students an opportunity to explore future educational and career paths (Stepath and Bacon, 2010). During this project, students had an opportunity to explore water quality testing. They also learned

about scientific careers that study what marine mammals eat through a microworlds video.

### **Action Plan**

Due to inclement weather, students did not have an opportunity to mark the storm sewers in the housing development. That activity is scheduled for June 10<sup>th</sup> if it is not raining. Students are going to conduct on-going water testing of the storm water to determine if there are seasonal differences. They are also going to create an informational handout for members of the housing development. Our school is being remodeled over the next school year, so students have decided to plan a water festival in collaboration with community partners to educate community members about our watershed.

Our temporary school site for next year is located within walking distance of a lake. Students will conduct water quality testing monthly and report it to the state data base. They will also continue their collaboration with Nisqually River Education Project.

### **Final Reflection**

As one of the students said earlier, everything is a cycle. Service-learning is also a cycle (National Youth Leadership Council, 2011). As my class completes one service-learning project their reflections automatically lead to another. It is becoming a way of life in our classroom. Not only am I able to use environmental service-learning projects to facilitate my students meeting state science and social

studies standards but I can also use it to create a sense of community in my classroom that didn't exist previously. Students on the autism spectrum have a deficit in perspective taking. Although they are very intelligent, often times they are not interested in participating in traditional school settings in order to learn reading, writing, math, social studies, and science. This deficit in perspective taking also impacts their social interactions. Since my class has implemented environmental service-learning projects, I have observed an increase in positive social interactions among my students.

I have also observed an increase in critical thinking skills. All the way from the fourth grader that identified the "death cycle" to the first grader who stands in front of the recycling sign every day after lunch to determine which items can be recycled and which need to go in the garbage.

My classroom is a self-contained special education class and therefore my students loop with me. Environmental service-learning provides an excellent opportunity for students to build on prior knowledge. Although we may do the same or similar projects each year, students will be adding new information to their repertoire and developing metacognition (Bransford, J., Brown, A., Cocking, R., editors, 2000). It is the cycle of learning.

### References

Autism Speaks. (2011). Retrieved from

<http://www.autismspeaks.org/diagnosis/index.php>

Attwood, T. (2008). *The Complete Guide To Asperger's Syndrome*. PA: Jessica Kingsley Publishers.

Bransford, J.D., Brown, A.L., & Cocking, R.R. [Eds.]. (2000). *How People Learn: Brain, mind, experience and school*. Washington, DC: National Academies Press.

Dentith, A., & Harper, F. (2010). The self, social and subject in service-learning and environmental studies. *Journal of Curriculum and Pedagogy*. 7(1), 61-80.

Furco, A., Root, S. (2010). Research demonstrates the value of service learning. *Phi Delta Kappan*, 91(5), 16-20.

Hutzel, H., Russell, R., & Gross, J. (2010). Eighth graders as role models: a service-art collaboration for social and emotional learning. *Art Education*, 63(4), 12-18.

Jenkins, A., & Sheehey, P. (2009). Implementing service learning in special education coursework: what we learned. *Education*, 129(4), 668-682.

Lawrence, M., & Butler, M. (2010). Becoming aware of the challenges of helping students learn: an examination of the nature of learning during a service-learning experience. *Teacher Education Quarterly*, 37(1), 155-175.

McPherson, K. (2011). Retrieved from

<http://education.jhu.edu/newhorizons/strategies/topics/service-learning/>

Mitchell, T. (2007). Critical service-learning as social justice education: a case study of the citizen scholars program. *Equity & Excellence in Education*, 40(2), 101-112.

National Service Learning Clearing House. (2010). Retrieved from

[www.servicelearning.org/whatiservice-learning/characteristics/index.php](http://www.servicelearning.org/whatiservice-learning/characteristics/index.php)

National Youth Leadership Council. (2011). Retrieved from [www.nylc.org](http://www.nylc.org)

Office of Superintendent of Public Instruction. (2011). <http://standards.ospi.k12.wa.us/>

Ponder, J. & Lewis-Ferrel, G. (2009). The butterfly effect: the impact on citizenship education. *Social Studies*, 100(3), 129-135.

Reynolds, J., Ahem-Dodson, J. (2010). Promoting science literacy through research service learning – an emerging pedagogy with significant benefits for students, faculty universities, and communities. *Journal of college Science Teaching*, 39(6), 24-29.

Stepath, C., & Bacon, J. (2010). Marine debris clean-ups as meaningful science-learning. Paper presented at the American Geophysical Union, Portland Oregon.

Terry, A., & Bohnenberger, J. (2004). Blueprint for incorporating service learning: a basic developmental K-12 service learning typology. *Journal of Experiential Education*, 27(1), 15-31.

**Appendix: A**

4<sup>th</sup> grade pre/post test

1. Draw a picture of an ecosystem for salmon.
2. Draw a picture of the water cycle. Explain how the system works.
3. Draw a simple food web. Draw arrows properly and identify the producers and consumers.
4. How do humans impact the environment?
5. What can you do to protect salmon habitat?

Younger/lower functioning students

1. Draw a picture of an ecosystem for salmon.
2. What can you do to protect salmon habitat?

## **Appendix:B**

Interview questions – 4<sup>th</sup> grade

1. Describe the perfect ecosystem for salmon.
2. Explain what the water cycle is and how the system works.
3. What is a food web? Explain why it is important.
4. How do humans impact the environment?
5. What can you do to protect salmon habitat?
6. Explain how you sorted living/non-living. What does living mean?

Interview questions for younger/lower functioning students.

1. Explain how you sorted living/non-living.
2. What would you find in an ecosystem for salmon?
3. What can you do to protect salmon habitat?



## Appendix: C

	1	2	3	4
Describe the perfect ecosystem for salmon	Describes 1-2 components but does not describe the relationship	Describes the relationship between fish/water	Describes the relationship between River/fish and 1-2 additional plants and animals in the ecosystem.	Describes the relationship between River/fish and 3 or more additional plants and animals in the ecosystem.
Define "water cycle" and explain how the system works.	Identifies 1- 2 components of the water cycle. Does not explain the relationship	Identifies 3-4 components of the water cycle. Explains the relationship.	Identifies 4-5 components of the water cycle. Explains the relationship.	Identifies 6 or more components of the water cycle. Explains the relationship.
Define food web and explain why it is important.	Incomplete definition. Does not define consumer and producer.	Defines consumer & producer and explains the relationship between them.	In addition to the criteria for 2, students explain how population can affect the food web.	In addition to the criteria for 3, students give specific examples from current events.
Explain how humans impact the environment	Identifies 1 way humans impact the environment	Identifies 2-3 ways humans impact the environment positively & negatively	Identifies 4-5 ways humans impact the environment positively & negatively	Identifies 6 or more ways humans impact the environment positively & negatively.
Define living. Explain how you sorted living/non-living.	<59% accuracy and has difficulty describing how they sorted the pictures.	60% - 79% accuracy and is able to explain how they sorted the pictures.	80% - 89% accuracy and is able to explain how they sorted the pictures.	90% accuracy and is able to explain how they sorted the pictures

Pre/Post Test	1	2	3	4
Picture of an ecosystem	Draws a picture No labels	Draws & labels River/fish	Draws & labels River/fish 1-2 additional plants and animals	River/fish 3 or more additional plants and animals
Picture of the water cycle	Draws a picture with 1-2 elements. May not be able to explain how they interact.	Draws a picture with 3-4 elements and explains how they interact.	Draws a picture with 4-5 elements and explains how they interact.	Draws a picture with 6 or more elements and explain how they interact.
Picture of a food web	Draws a picture but does not label producers and consumers	Draws a picture of a food web and identifies producers and consumers.	Draws a picture of a food web and identifies the producers and consumers and explains how population can affect the web	In addition to the criteria for 3 the student gives specific examples from current events.
How humans impact the environment	Identifies 1 way humans impact the environment	Identifies 2-3 ways humans impact the environment positively & negatively	Identifies 4-5 ways humans impact the environment positively & negatively	Identifies 6 or more ways humans impact the environment positively & negatively.
What can you do to protect salmon habitat?	Describes 1 way to protect salmon habitat	Describes 2-3 ways to protect salmon habitat	Describes 4 or more ways to protect salmon habitat	Propose a plan to protect/improve an ecosystem and explain why their plan would be effective.